

# OPENING REMARKS BY

**JULIE BEAL**

**DIRECTOR OF PUBLIC AFFAIRS  
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November 1, 1995



**G**ood morning. Welcome to this very special symposium on fatigue in transportation. It is particularly good to greet you – the people who are in the best position to identify and possibly prevent the deadly effects of fatigue on transportation safety.

First let me tell you who you are. You are pilots, air traffic controllers, flight attendants, mechanics, railroad engineers, conductors, truckdrivers, pipeline operators, riverboat pilots, marine captains and mates. You represent unions, management, academia, government and political action groups. You are from 16 countries from around the world and you all sit here together today as one industry prepared to work toward a common goal – safety. I congratulate you for that.

We have a great deal of work to do over the next two days. Today we will learn from some of this country's premiere authorities about fatigue and its effects on the human body. More importantly, we will learn how this knowledge can be applied to improve operator sleep, alertness and performance. Tomorrow we will break out into modal groups to discuss how this information can be incorporated into your specific operational environment. We recognize that you will not leave with all of the so-

lutions, but perhaps collectively we can move a step or two closer to combating this safety problem.

You have plenty of reading material. NASA studies and NTSB reports and recommendations are provided to help you better understand our perspective on the issues surrounding fatigue. Also there is a fatigue resource directory that Dr. Rosekind will describe in detail later today and a list of participants.

Over the past year, I've had the pleasure of working with Dr. Mark Rosekind from the NASA Ames Research Center in putting together today's symposium. His professionalism and expertise in the area of fatigue have left me with no doubt that you are in good hands today. I am sure that you too will be impressed by the information offered by the educational program developed under his leadership at NASA.

Thanks also to NTSB Chairman Jim Hall for his insights and for having the conviction to sponsor this event. Through this symposium the Chairman advances the spirit of the recommendations the Safety Board makes to others. He should be commended for his leadership in putting together his educational opportunity.

Jim came to the Board two years ago and has served as Chairman since October, 1994. Since his term began Jim has been to the scene of ten major accidents including the fatal aviation accidents at Roselawn, Indiana; Pittsburgh, Pennsylvania, and Raleigh Durham, North Carolina. He has also been to several surface accidents including the Ringling Brothers Circus train in Lakeland, Florida, and the major highway/railroad crossing accident in Sycamore, South Carolina. He has seen, first hand, the tragedies left in the wake of accidents. Today represents his dedication to preventing other tragedies.

With this said, I would like to welcome you, challenge you to work hard and introduce you to Chairman Jim Hall.

A handwritten flourish consisting of a wavy line with a small loop in the center.

**REMARKS BY**  
**THE HONORABLE JIM HALL**  
**CHAIRMAN, NATIONAL TRANSPORTATION SAFETY BOARD**

**November 1, 1995**



**G**ood morning. I would like to welcome everybody to this symposium, probably the first time so many leaders of government and the private sector have been gathered in one place to address one of the major hazards of transportation -- fatigue. With the help of the National Aeronautics and Space Administration (NASA), we have put together what we hope will be an educational and thought-provoking conference that will, in the end, save lives.

I want to make sure I acknowledge the tireless work of Julie Beal, the Safety Board's Director of Public Affairs, and her committee for planning, organizing and running this conference. And I want to thank Dr. Mark Rosekind of NASA for his invaluable contribution to the concept and organization of this event.

As you probably know, the National Transportation Safety Board is an independent federal agency with two major tasks: to determine the probable causes of major transportation accidents and to issue safety recommendations aimed at preventing such accidents. We fulfill this mandate in several ways: by investigating accidents, by conducting safety studies, and by convening symposiums like the one we're beginning today.

Although fatigue has assuredly been with us for a long time, it was not until the industrial age and the advent of complex machinery that fatigue became a major hazard to life and limb. With the increasing industrialization of society, people are exposed more and more to the dangers of fatigue. Today, we need only drive from our homes, live near railroad tracks, or board an airplane to face first-hand potential dangers from operator fatigue.

The Safety Board issued nearly 80 fatigue-related safety recommendations since 1972 to the modal administrations in the Department of Transportation, transportation operators, associations and unions. As a result of our experiences in investigating accidents in all modes of transportation over the years, we grew to appreciate the importance of human factors studies and established a human performance office in 1983.

In 1989, we issued three major safety recommendations to DOT, calling for a coordinated and aggressive federal program to address the fatigue problem in all sectors of the transportation industry. In the intervening six years, DOT launched initiatives to address these recommendations, and Secretary Peña will undoubtedly describe them to you in depth tomorrow.

The fact is, however, that while we all study the problem, accidents continue to happen. You will hear later this morning about some of the larger accidents the Safety Board investigated in recent years where fatigue was a cause or factor -- the EXXON VALDEZ; the Thompsonstown, Pennsylvania freight train collision; and the crash of a DC-8 at Guantanamo Naval Air Station are just three examples.

What is interesting about fatigue is that every one of us here knows exactly how it feels and what it does to us. We've all experienced the dramatic effects of extreme fatigue when we tried to drive an hour longer than we should, or we tried to stay up to watch a movie, or we tried to act interested listening to one of my speeches.

Oftentimes, though, the effects of fatigue are more subtle and, therefore, more insidious. In the past it was difficult to identify fatigue as a causal factor in an accident investigation. But we are getting better at it, and, more importantly, we're beginning to learn how to counteract it. If you don't already, you will have a good handle on this by the time you leave tomorrow afternoon.

The factors contributing to fatigue are becoming increasingly prominent. Our society now demands that goods be shipped anywhere in the country -- or even around the world -- overnight. Many factories have adopted just-in-time materials delivery.

Trucking deregulation might have been a boon to businesses and consumers by resulting in lower rates, but it didn't alleviate the problem of fatigue for truck drivers. On the contrary, it might have added to the pressures that lead to fatigue.

Commuter airline pilots often fly a dozen legs in one day, and after a shortened rest period, do it again the next day. The jet age made it possible for both passengers and crewmembers to experience jet lag, which can cause fatigue by rapid travel across time zones, that even rest cannot immediately alter.

As the demand for goods and the availability of transportation continues to grow, and the time we want to wait for such services continues to decrease, we see vehicles getting larger and larger:

- Jumbo jets now carry more than 500 passengers, and aircraft are on the drawing board that would carry more than 1,000.
- The average size of ships calling at U.S. ports grew five-fold in the last 50 years, with crew sizes cut in half. In many of the major ports, the normal clearance from the bottom of the harbor for these deep-draught ships is often as little as two feet.
- Where once we mostly saw 10-ton vegetable trucks on our highways, we now see double-bottomed and triple-trailer trucks on the interstates.
- More than 200 million hazardous materials shipments criss-cross the country every year by road and rail.

This conference will highlight for you the importance of fatigue countermeasures, and how they can be applied to prevent accidents in all modes of transportation. The American taxpayer invested millions of dollars in research into programs that examine fatigue. This forum presents an opportunity for us to learn spe-

cifically about the NASA countermeasures program, as well as sharing information on specific research projects currently underway.

In recent years, Congress has set up the National Commission on Sleep Disorder Research, and issued a report on the role biological rhythms play in fatigue. As I've already mentioned, DOT took initiatives on several fronts to study fatigue. Along with the trucking industry, DOT is conducting a truck driver fatigue study and an older driver study. We at the Safety Board early this year completed a major study on truck driver fatigue.

We applaud all that has been accomplished in the field of research from the government, academia and the private sector. But at some point we must decide that, while research should never end, the time for study must yield to a time for action. It is time to put what we have learned, and what has been provided to us by the taxpayer, into the hands of the transportation operators for the protection of the American people.

This conference is structured around another government funded study, the Fatigue Countermeasures Program developed by Dr. Mark Rosekind at NASA Ames Research Center. Although developed for aviation, it can be adapted for the other modes of transportation as well.

This kind of "cross pollination" between transportation modes is not unique. In fact, the Safety Board is always looking for innovative ways to address a transportation problem, even if it originates in a different mode.

Fifteen years ago, a concept called Cockpit Resource Management was developed for the aviation industry. Again originating from pio-

neering work at NASA Ames, this training method is now called Crew Resource Management. The Board recommended that the FAA and the airline industry adopt this training method that encourages teamwork, with the captain as the leader who relies on the other crewmembers for vital safety-of-flight tasks. The Safety Board recommended it for other modes, and it is gaining acceptance in the marine industry, which calls it Bridge Resource Management.

We believe that borrowing successes from one mode or one State for the betterment of another is nothing more than spreading the word on practical, cost-effective methods that work. We did just that more than 20 years ago when we saw how effective the few pipeline one-call systems were in preventing underground damage accidents. We asked all States to implement similar programs. Today, the entire country is served by these lifesaving programs.

To promote the use of these programs and others aimed at preventing these accidents, we convened a national excavation damage workshop last year.

Twenty years ago we learned of the "Operation Lifesaver" rail/highway grade crossing program that was in use in six or seven States. We asked all States to initiate these programs and urged that a national coordinating effort be launched. Today, 49 States have Operation Lifesaver programs and the number of deaths at crossings have been reduced by half.

Another major success story we can point to deals with how the States are combatting the drinking-and-driving problem. Based on what we found to work in a few States -- raising the drinking age and instituting administrative li-

cense revocation, for example -- we asked all States to follow suit. As a result of our efforts and those of many others, including grass roots organizations, drunk driving fatalities dropped 35 percent in the last 12 years. The age-21 laws alone saved almost 15,000 lives.

And that, after all, is why we're here -- to save lives. It is a fact that more than 43,000 Americans lost their lives in transportation accidents last year. That should provide us with all the motivation we need.

Tomorrow, after hearing from Secretary Peña, you'll be breaking into working groups in which you and your fellow professionals will determine how to adapt the NASA Ames Fatigue Countermeasures Program to your mode's specific needs.

The fruits of this conference won't be known for years. The trucking industry, for example could very well develop useful fatigue countermeasures for its longhaul drivers. But it is estimated by industry that trucks account for just four percent of highway fatigue-related crashes. If these numbers are true, imagine the impact of these countermeasures when they eventually spread to the general automobile-driving population, the source of the other 96 percent of fatigue-related highway crashes.

I believe this conference will prove to be a pebble thrown into a pond. The ripple effect will be felt for many years to come as all of you begin to apply what you've learned here to the betterment of your company or industry. I'm proud that NASA and the National Transportation Safety Board were able to put this conference together, but its success depends on you.

With all this said, it is time to move on with the program. We will begin today with a presentation by Jim Danaher. Jim is currently the Chief of the Operations Division in our Office of Aviation Safety, and he has been with the Board virtually since its inception as an independent agency. More importantly, Jim was one of the founding fathers of the human performance division at the Board and has seen first-hand the evolution of our ability to document fatigue as a significant safety factor in transportation.

Jim will be describing the history of the Safety Board's investigations into fatigue-related accidents. Thank you for coming, and now let's get to work.



## REMARKS BY

# THE HONORABLE FEDERICO PEÑA

## SECRETARY, DEPARTMENT OF TRANSPORTATION

November 2, 1995



I want to say a special welcome to the representatives from Europe, the Mideast, and Asia who are here. I don't know if you're over your jet lag yet. But on Sunday, I leave for a 17-day, eight country trip to Asia, and I'm about to have first-hand experience with transportation fatigue!

I'll be on a trade mission to promote American products and services and open aviation markets. Since President Clinton took office, the private sector has created 7.5 million jobs - 2 million of which are export-related. We have signed 80 trade agreements.

As trade expands, 10 years from now you'll see truck traffic up 20 percent and rail traffic up a comparable number. Now, we have one-and-a-half million people flying every day in the United States, and within 10 years, it will be two-and-a-half million, every day boarding planes.

As Transportation Secretary, I want travellers to have a pleasurable experience. I want our companies to be globally competitive, and that means delivering people and products on time and efficiently. But most of all, I want safe roads, and safe skies, and safe waterways for the American public.

Sometimes, we get wrapped up in people taking different positions. Perhaps the unions wanting a day's pay for a day's work ... perhaps the transportation companies wanting more flexibility and speed ... and the traveling public demanding people flying planes or driving buses who are not tired and not falling asleep at the wheel.

Sometimes there's a disconnect between what everybody wants. But my bottom line is: the American people must trust us to make sure all transportation sectors are operating safely. Period.

When I became Transportation Secretary, I set as one of my highest priorities improving safety because 43,000 Americans are killed every year in transportation accidents.

I'm finding, as every other Transportation Secretary found, safety improvements don't come cheaply or easily. We have to work hard for every life we save, and as we see traffic increase, we'll have to work even harder.

I'm constantly conferring with leaders in the airline, railroad, truck, and bus industries to see how we can work together for the sake of the public and their employers.

Today, for this conference, I'm responding to NTSB Chairman Hall's challenge by releasing the Department of Transportation's: Fatigue Program Overview. It summarizes the research and technology development, public education, outreach, and operational strategies being used by my Department.

I commend the group of senior managers, who are coordinating our research. They meet regularly with the NTSB to keep the Board apprised of our efforts to respond to their fatigue-related recommendations.

The Department also will be assuming responsibility for the Fatigue Resource Directory, assembled for this symposium. We envision that you can access it on the Internet.

In the breakout sessions, you'll be discussing the overview in depth, but let me make five observations:

First, I'm convinced that changing human behavior has to be the next frontier to improving safety. Human factors cause a third of all railroad accidents and are the number one cause in aviation accidents. Operator error is probably the most important single factor in truck and bus accidents.

Second, if it's human behavior we must change, then we need to educate, and not just regulate. I know so much of our time is spent developing rules for dealing with fatigue. But there are several realities after you make the rules, such as how do you mandate rest? How do you monitor rest periods?

You can tell a person: "this is the time for you to sleep," but it doesn't do us any good unless he sleeps. It's really a matter of personal responsibility.

It's like having a seat belt in a car. The law says buckle up, but three out of 10 people still don't take the personal responsibility of buckling. And if we hadn't spent hundreds of millions of dollars educating the public far fewer would be buckling.

When it comes to fatigue, every person at every level of an organization -- each driver, each operator, each dispatcher, each manager must personally be responsible.

Third, it's important to understand fatigue is not just a matter of rest. Lots of factors cause fatigue, such as pressures from the job, and the operating environment, and whether it's dark or light. We need to look into those factors further.

Fourth, the traveling public has just as much right to expect transportation operators to be unimpaired by fatigue as they have the right to expect operators to be unimpaired by alcohol or drugs.

We now have the capability to test for alcohol or drugs. We don't have all the fatigue testing capability we would like -- yet.

But we've been obtaining encouraging results with both fitness-for-duty testing devices and with unobtrusive, noninvasive techniques to detect the onset of performance deterioration in operators. I hope these countermeasures are used in the near future.

A few months ago, I was in Portland with the President at a regional economic conference. And the president of Freightliner told us about work they were doing on ventilation systems in cabs to alleviate fatigue.



Fifth, we should be focused on how tired workers perform, rather than how tired a worker feels at the end of the day.

The danger from fatigue is not just that someone will nod off to sleep at the controls of a plane, ship, train or motor vehicle, although I'm sure all of those have happened.

The insidious danger is that the operator may become dulled enough to miss -- or misinterpret -- a critical danger signal, or be slow in responding to it.

In transportation safety where the commercial operator may be responsible for the lives of hundreds, we must guard against the one-in-a-million risk because that is what the public demands.

Now, let me address a few issues now before Congress. If ever there was an issue the federal government took the lead on, and did it well, it's highway safety. That is about to come unraveled.

Congress is about to eliminate the 55 miles-per-hour national speed limit, which we credit for saving more than 2,000 lives a year.

And ... Congress is about to eliminate motorcycle helmet laws. The last time they did that, in the 1970s, and had the states decide, 27 states decided there's no reason to have a helmet law. So, what happened? Motorcycle deaths increased 61 percent.

And ... Congress is about to exempt a large part of the commercial truck fleet from our truck safety regulations.

It is distressing. Here, we hold conferences like this. We do all of this research on fatigue

because we value life and the health of the nation and we know we can save one, two, or three lives at a time. But with one stroke, Congress is about to put at risk thousands of lives.

States would set their own speed limits. I met with state transportation secretaries from all 50 states on Monday. Many of them disagreed with me on who should be responsible for setting limits, but I told them we need to agree that safety must come first. We can't retreat on safety, because we have made too much progress.

We're making progress in every transportation sector.

In motor vehicles, the percent of all accidents caused by drunk drivers is down. Seat belt usage is up.

We have the world's safest air system, and are pursuing a goal of zero accidents.

In rails, 1994 was the safest year in history. Unfortunately, last week, there was a tragic school bus accident at a grade crossing in Illinois. I've formed a task force to review the design and construction approval process of highway and rail crossings, so that if there are holes, we'll find them.

Let me end on this. It's up to us ... each of us in this room ... to figure out how with all of that increased traffic we will see in the future, we can keep improving the safety record.

To ask what can we do to delay loss of alertness. To detect it if it occurs. And to prevent fatigue-based accidents.

So, I thank you for all your good efforts. As the President says: the best is yet to come, and it is.

Thank you very much.



## REMARKS BY

### JIM DANAHER

#### CHIEF, OPERATION FACTORS DIVISION NATIONAL TRANSPORTATION SAFETY BOARD

November 1, 1995



**G**ood morning ladies and gentlemen! I'd like to add my welcome to each of you to this symposium on fatigue countermeasures and commend you for your efforts to be here. The NTSB and NASA staffs have worked long and hard to organize this meeting and to make it as useful as possible. I sincerely believe that when you leave tomorrow, you will feel that your time and effort were well spent.

I'd like to provide a brief overview of the Safety Board's accident investigation experience that illustrates the nature and pervasiveness of human fatigue in transportation accidents. In its investigation of numerous accidents in all transportation modes, the Safety Board has identified serious and continuing problems concerning the far-reaching effects of fatigue, sleepiness, sleep disorders, and circadian factors in transportation system safety. We have seen repeated instances of poor scheduling of work and rest periods in all transportation modes that have or might have affected adversely the performance of operating personnel.

The investigations also indicate that many transportation industry employees and supervisors fail to receive training on the problems associated with work and rest schedules. And with a few exceptions, management and labor

segments also fail to properly consider the harmful consequences that irregular and unpredictable work and rest cycles can have on people who operate vehicle.

Some of the clearest examples of the effects of operator fatigue problems are seen in major highway accidents. A Safety Board study of 182 fatal heavy truck accidents found that driver impairment due to fatigue was the most frequently cited single cause or factor (31 percent) in the accidents investigated. Additionally, one third of the drivers who were identified as being fatigued were also impaired by alcohol and/or drugs. The Board stated, "Some truck drivers apparently do not realize that fatigue is aggravated after the initial effects of stimulants. Sleep deprivation becomes a deficit that drugs cannot overcome. Further, depressants, such as alcohol, aggravate fatigue and reduce the initial effect of stimulants.... The only way to repay the 'deficit' is to sleep."

The Board recommended that major trucking and shipping associations encourage their members to participate in education programs on the effects that long working hours and irregular schedules have on driver fatigue. The establishment of education programs covering the interaction of alcohol/drugs and fatigue were urged as well.

The Safety Board has also found that fatigue is a factor in railroad accidents. The January 1988 collision of two Conrail trains near Thompsontown, Pennsylvania, is a good example of the way fatigue and irregular work schedules play a causal role in accidents. At 7:54 a.m., a westbound Conrail freight train collided with an eastbound Conrail train, fatally injuring the engineers and brakemen on both trains, and resulting in more than \$6 million in damage.

The Safety Board determined that the probable cause was the sleep-deprived condition of the engineer and other crewmembers of the eastbound train, which resulted in their inability to stay awake and alert, and their failure to comply with restrictive signals. Factors involved in the crewmembers' sleep condition were their unpredictable work and rest cycles, and their voluntary lack of proper rest before going on duty. The inadequacy of the locomotive safety backup alertness systems also contributed to the accident.

This accident illustrates several aspects of existing railroad operations that can adversely affect train crews' performance of their duties, and, ultimately, the safety of rail transportation. Specifically, the Safety Board found that the engineer and brakeman of the eastbound train probably were suffering chronic sleep deprivation because their work shifts and off-duty periods at home were unpredictable and irregular. Nevertheless, the crewmembers customarily participated in the normal work and living routines of their families, sleeping during conventional night hours. They did not attempt to get meaningful daytime sleep, even though they anticipated calls to work late in the day or at night. Instead, they would try to get by without adequate sleep until their next off-duty period. None of the crewmembers of

the train that failed to comply with the signals had more than two hours of restful sleep during the 24 hours preceding the accident. The Safety Board concluded that the crewmembers' sleep-deprived condition was compounded by the monotonous environment of the locomotive cab, and possibly by their failure to eat a meal for at least 13 hours before the accident. Finally, we found that the engineer of the errant train was able to defeat the safety redundancy intended by the automatic train stop (ATS) device. Apparently, the act of acknowledging the signal became so routine that the engineer was able to accomplish it without being alert.

Nearly two years later, a remarkably similar train collision occurred in California that also was attributed to operator fatigue.

On November 7, 1990, at about 4:11 a.m., two Santa Fe Railway Company freight trains collided head on in Corona, California. The westbound train, which was traveling from Barstow, to Commerce, California, was directed onto the Corona siding. But it passed the stop signal, and the lead locomotive reentered the main track area, blocking all movement on the main track. The eastbound train, was on the main track and collided with the westbound train. Each train had three-person crews.

As a result of the collision, the entire crew of the westbound train was killed, and four locomotives and three rail cars were derailed. The engineer and conductor of the westbound train sustained serious injuries and the brakeman was killed; all three locomotives and five rail cars were derailed. Total damage was over \$4 million.

The Safety Board determined that the probable cause was the failure of the westbound train engineer to stop his train at the stop signal because he was asleep. Contributing to the accident was the failure of the conductor and the brakeman to take action to stop the train, probably because they too were asleep. Also contributing to the accident was the irregular unpredictable work schedule of the westbound train engineer; the railroad's lack of a policy or procedure for removing crewmembers from service when they are not fit for duty because of lack of sleep; and the inadequacy of the Federal rules and regulations that govern hours-of-service.

The March 1989 grounding of the EXXON VALDEZ in Alaska demonstrated the role fatigue plays in marine accidents. Although the Safety Board's report on that accident cited the master of the tanker in its probable cause statement for failing to provide "a proper navigation watch" around an ice flow, it also determined that the third mate, who had assumed the watch, was fatigued at the time of the grounding and overburdened by an excessive workload.

In safety recommendations to the Coast Guard, the Exxon Shipping Company, and other shipping companies, the Safety Board pushed for improvements in regulations, policies, and procedures concerning vessel manning levels, work hours, and off-duty time for rest.

Costs to individual companies of these accidents is staggering. As I am sure you are aware, the grounding of the EXXON VALDEZ resulted in lost cargo worth \$3.4 million and in damage to the vessel of \$25 million. To clean up the spill and settle associated law suits has cost \$3 billion to date. In addition, Exxon was ordered to pay punitive damages of \$5 billion.

Approximately three months after the EXXON VALDEZ, disaster another marine accident occurred that was attributed, in large part, to the adverse effects of fatigue.

At 4:39 p.m. on June 23, 1989, the Greek tankship WORLD PRODIGY, en route from Bulgaria to Providence, Rhode Island, carrying more than 195,000 barrels of diesel fuel grounded on Brenton Reef in Rhode Island Sound. At the time of the grounding, the vessel was under the navigational control of the master. As a result of the grounding, the hull of the WORLD PRODIGY sustained extensive damage, and spilled 7,000 barrels of diesel oil into Rhode Island Sound and Narragansett Bay. Because of the nature of the oil and of the warm temperatures during the days immediately following the accident, much of the spilled oil quickly evaporated, minimizing the damage done to the nearby coastline. There were no deaths or injuries. Damage to the vessel was estimated at more than \$1 million.

The Safety Board determined that the probable cause was the master's impaired judgment from acute fatigue, which led to his decisions to decrease the bridge watch and attend to nonessential tasks during a crucial period in the ship's navigation.

Let's now turn to aviation. On August 18, 1993, at about 5:00 p.m., a DC-8 freighter, registered to American International Airways, crashed about 1/4 mile from the approach end of the runway, after the captain lost control of the airplane while approaching the Leeward Point Airfield at the U.S. Naval Air Station, Guantanamo Bay, Cuba. The airplane was destroyed and the three flight crewmembers sustained serious injuries. Visual meteorological conditions prevailed. The flight was conducted under the regulations governing Supple-

mental Air Carriers, as an international, non-scheduled, military contract flight.

The flightcrew had been on duty about 18 hours and had flown approximately nine hours at the time of the accident. The company had intended for the crew to ferry the airplane back to Atlanta after the airplane was offloaded in Guantanamo Bay. This would have resulted in a total duty time of about 24 hours and 12 hours of flight time, the maximum permitted under the rules for supplemental air carriers on overseas and international flights.

The NTSB determined that the probable causes were the impaired judgment, decision-making, and flying abilities of the captain and flightcrew due to the effects of fatigue; the captain's failure to properly assess the conditions for landing and maintaining vigilant situational awareness of the airplane while maneuvering onto final approach; his failure to prevent the loss of airspeed and avoid a stall while in the steep bank turn; and his failure to execute immediate action to recover from a stall.

Contributing factors were the inadequacy of the flight and duty time regulations applied to Supplemental Air Carrier, international operations, and the circumstances that resulted in the extended flight/duty hours and fatigue of the flightcrew member.

This was the first time the Board cited fatigue as a causal factor in an air carrier accident.

The Board also identified fatigue as a concern in its commuter airline safety study. Human fatigue was further addressed by the Board in the investigation of a non-fatal-in-flight loss of control and forced landing at Pine Bluff, Arkansas, of a Continental Express flight on April 29, 1993. The Board cited fatigue in-

duced by the flightcrew's failure to properly manage provided rest periods as a contributing factor, and recommended that commuter air carriers provide aircrews information on fatigue countermeasures.

This accident brought to the attention of the aviation community the need for flightcrews to be adequately rested before a flight. The FAA has begun reviewing its rest and duty time rules and regulations pertaining to flightcrews, and intends to issue a notice of proposed rulemaking regarding flight and rest requirements for both the major and the commuter carriers. The Safety Board has accepted FAA's action plan.

Nearly six years ago, following a series of major fatigue related transportation accidents, the Safety Board recognized the need for more concerted action on fatigue problems in transportation. While there had been some private research conducted on this issue, in 1989 the Safety Board was unaware of any systematic activity by the Department of Transportation to address these safety concerns. Then the Board issued safety recommendations to the DOT urging that coordinated research programs be expedited, that educational material be developed and disseminated to transportation industry management and other personnel regarding this issue, and that all DOT regulations related to work scheduling and hours-of-service be reviewed and upgraded to incorporate the results of the latest research.

The Secretary of Transportation responded to these recommendations later that year, citing a number of initiatives. We will receive a further update on the status of these DOT initiatives from Secretary Pena tomorrow.

The problems of human fatigue in transportation system safety have been included as a part of the Safety Board's "Most Wanted" Transportation Safety Improvement Program since 1990. Since that time, considerable progress has been made by government, industry, and academia in addressing the problem. But much remains to be done. The idea for this symposium originated with our Chairman, and we on the Safety Board staff are firmly committed to make it one more step in our common efforts to improve the safety of America's traveling public. We earnestly seek your support in this very worthwhile goal -- not only in the next two days, but thereafter as well.

Thank you!

